

PATENT CLAIMS

1. Process for longitudinally drawing an at least single-ply film (1) of thermoplastic polymer which film is heated, before drawing in the slowly operating part of the drawing unit, to a temperature suitable for drawing and passed to a drawing zone (10), the slowly operating part of the drawing unit containing at least one driven roller (2) and the rapidly operating part of the drawing unit containing at least a driven roller (3) and the pair of rollers (2)/(3) being arranged in such a way that a drawing gap (4) is formed between these two rollers (2)/(3) and the film (9) is passed into the drawing gap (4) characterised in that the film (1) is mechanically gripped by a fixing device, during drawing in the area of the drawing gap (4) between the rollers (2)/(3) in the peripheral areas (10) and fixed in such way that the width of the film, which it exhibits on entering the drawing gap (4) is not significantly changed during drawing.
2. Device for drawing a film web of thermoplastic polymer comprising at least 1 driven roller (2) which is driven at the speed of V1 and at least a second driven roller (3) which is driven at a speed of V2, $V1 < V2$ and the rollers (2)/(3) being arranged in such a way that a drawing gap (4) is formed between the two rollers (2)/(3), characterised in that between the two rollers (2)/(3), a width-maintaining device is arranged which mechanically grips both peripheral areas of the film web in such a way that the width of the film web remains essentially unchanged during longitudinal drawing in the drawing gap (4).
3. Device according to claim 2 characterised in that the width-maintaining device consists of two pairs of

carriages (5a) and (5b), i.e. four carriages in total, one pair of carriages (5a) and (5b) being positioned on one foil periphery and each of the four carriages exhibiting several rolls (6a) and (6b) which are arranged in sequence, one carriage being arranged on each film periphery above and one carriage opposite below the film web and the carriages (5a) and (5b) arranged above and below a film periphery being positioned vis-à-vis each other in such a way that the rolls (6a) and (6b) are aligned in the direction of advance (9) of the film and the pairs of rolls (6a) and (6b) lying opposite each other gripping/touching the film web lying in between in the peripheral area (10).

4. Device according to claim 2 or 3 characterised in that the length of the row of rolls corresponds approximately to the length of the drawing gap (4) such that the rolls (6) of the carriages (7) are arranged over the length of the drawing gap.
5. Device according to one of claims 2 to 4 characterised in that each carriage (5) exhibits a double row arrangement of the rolls (6), the two rows of double rows being arranged displaced to each other such that the distance between the contact points (8) with the film is halved compared with a single row arrangement of the same structural design.
6. Device according to one of claims 2 to 5 characterised in that the rolls (6) are freely rotatable and not driven.
7. Device according to one of claims 2 to 5 characterised in that the rolls (6) are equipped on their surface with a rubber or metal coating.

8. Device according to one of claims 2 to 7 characterised in that the carriages (5a) and (5b) can be moved by means of a pressure cylinder away from the film web or towards the film web and that the fixing pressure of the pairs of rolls (6a) and (6b) situated above and below the film web can be regulated via the pressure cylinder.
9. Device according to one of claims 2 to 8 characterised in that the rolls (6) are moveably connected with the carriages (5).
10. Device according to claim 9 characterised in that the rolls (6) are connected via a cylindrical slide bolt (12) with the carriage (5).
11. Device according to claim 10 characterised in that the rolls (6) are placed against a spring type pressure piece.
12. Device according to one of claims 2 to 11 characterised in that one carriage of each pair of carriages (5a) and (5b) in each case additionally exhibits a slide rail (15) such that a pair of carriages comprises a carriage with a slide rail (15) and a carriage without slide rail (15) which are positioned opposite each other above and below the film web.
13. Device according to claim 12 characterised in that the slide rail (15) is arranged in the area between the first roll in the drawing zone and the slower roller (2) and a second slide rail (15) is arranged between the last roll in the drawing zone and the more rapidly operating roller (3).
14. Device according to claim 12 or 13 characterised in

that the slide rails exhibit a tapering end towards the rolls (6) and towards the roller (2) and/or (3).

15. Device according to claim 13 or 14 characterised in that the carriages without slide rail (15) exhibit additional rolls (18) which are situated opposite the slide rail (15).
16. Device according to one of claims 3 to 15 characterised in that the rolls (6) exhibit a profiled surface.
17. Device according to claim 16 characterised in that the profiled rolls are covered with O rings of metal or rubber.
18. Device according to claim 16 characterised in that the surface of the rolls is profiled by engraving.
19. Device according to claim 18 characterised in that the rolls exhibit a profiled rubber coating.
20. Process for longitudinal drawing of a film web by means of a device according to claim 1 characterised in that the film is first guided over the slowly rotating roller (2), subsequently passes through the drawing gap (4) and is then passed over the rapidly operating roller (3) characterised in that, during drawing in the drawing gap (4) both peripheries of the film are fixed between the rolls (6) of the two pairs of carriages.
21. Process according to claim 20 characterised in that the film is drawn by means of a device according to one of claims 3 to 19.
22. Process according to claim 20 or 21 characterised in

that a biaxially drawn film is drawn in the longitudinal direction.

23. Process according to one of claims 20 to 22 characterised in that the biaxially drawn film was drawn during its manufacture longitudinally by a factor in the region of 3 to 6 and transversely by a factor in the region of 5 to 12.
24. Process according to one of claims 20 to 23 characterised in that the film is drawn longitudinally with a factor of >1 to 5.
25. Process according to one of claims 20 to 24 characterised in that the film is a biaxially drawn polypropylene film which exhibits a thickness of 22 to 100 μm .
26. Process according to claim 20 or 21 characterised in that a cast film is drawn in the longitudinal direction.
27. Process according to claim 20 or 21 characterised in that a prefilm is drawn in the longitudinal direction.
28. Process according to claim 26 or 27 characterised in that the film is drawn longitudinally by a factor of 2 to 7.